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Notes on the distribution, ecology, associated vegetation and conservation status of *Gymnadenia* (Orchidaceae) in Kosovo

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Abstract

Four species of *Gymnadenia* are native to Kosovo: *G. conopsea*, *G. frivaldii*, *G. nigra*, and G. *odoratissima*. In this study, field expedition data, phytosociological relevés, herbarium specimens along with extensive literature sources were used to analyse vegetation and ecological characteristics, habitat types, distributional patterns as well as provide notes on conservation. *Gymnadenia conopsea* is distributed throughout the country, from lowlands to the alpine belt. It was recorded in various plant communities. *Gymnadenia frivaldii* grows in the alpine zone of mountains, close to streams and in wet meadows. Its relevés belong to the class *Scheuchzerio-Caricetea fuscae*. This species is classified as "Near Threatened" (NT) in Kosovo. *Gymnadenia nigra* grows in subalpine and alpine grassland on preferably calcareous substrate. It has been found in almost all mountains reaching >2000 m a.s.l., and occurs in different plant communities belonging to the class: *Elyno-Seslerietea*. *Gymnadenia odoratissima* was recorded from one locality only in Kosovo, on the massif of Maja e Zezë, Sharri Mts. It was growing in degraded beech forest and meadows on silicate bedrock. Its floristically diverse relevés associate with the class: *Mulgedio-Aconitetea*. Of the four studied species, *G. frivaldii* deserves more conservation attention because of its fragile populations.

Keywords

Flora, orchids, plant conservation, phytosociology, SE Europe

Introduction

As a result of various human activities in recent years, many plant species have become vulnerable, threatened or even extinct. In Kosovo, as in many other parts of Europe, increased agricultural and forestry activities, combined with a cessation of the traditional management of meadows, centralization of farming and expansion of urban areas has deprived many plant species from their natural habitats. The consequence of this being the confinement of once large plant populations to smaller areas, mainly in remote and fragile habitats.

Several studies have shown that habitat fragmentation and small, scattered plant populations adversely affect the genetic structure of a species (Young et al. 1996; Bateman et al. 2003). Fragmented populations are exposed to a higher risk of restricted gene flow and loss of genetic polymorphism (Franklin 1980; Frankel and Soulé 1981; Berisha et al. 2015). In the long term, probably the main adverse effect will be the inability of the species to adapt or respond to ever-changing environmental conditions (Ellstrand 1992).

The aim of different conservation programs nowadays is to preserve natural habitats and with it the existing level of genetic diversity, especially in the case of rare and endangered species (Ellstrand et al. 1993; Gray 1996). Knowing that in developing countries like Kosovo, available resources for the conservation of nature are limited, the identification of conservation priorities is of crucial importance.

Orchidaceae are a very diverse and species-rich family of plants, that represent nearly 10% of all angiosperm species. They are characterized by considerable floral diversity and a unique and often intricate pollination biology. The research focus on the biology of these plants has been mainly directed towards their pollination, adaptations to pollinators, evolution of pollination traits and the evolutionary outcomes of their unique biology (Schiestl et al. 1999; Huber et al. 2004; Cozzolino and Widmer 2005). Additionally, as the family contains numerous rare, threatened and endangered species, studies on members of the group are of fundamental importance in plant conservation efforts (Case et al. 1998; Ávila-Díaz and Oyama 2007; Tsiftsis et al. 2008, 2019).

In the present study, the genus *Gymnadenia* R.Br. (Orchidaceae) in Kosovo is studied with emphasis on its distribution, species composition, diversity, ecological and associated vegetation characteristics. *Gymnadenia* is represented in the country by four naturally occurring species: *G. conopsea* (L.) R.Br., *G. frivaldii* Hampe ex Griseb., *G. nigra* (L.) Rchb.f., and *G. odoratissima* (L.) Rich. Of these, only *G. frivaldii* is of conservation concern, being categorized as "Near Threatened" (NT) in the Kosovarian Red List of plant species. The main aims of the study were to: a) study the distribution of the four *Gymnadenia* species in Kosovo and understand their distributional patterns; b) conduct phytosociological relevés in order to provide information about the most common plant communities where these species grow and generally analyze their syntaxonomy; c) provide ecological characteristics for each species concerning EUNIS habitat type preferences; and d) assess conservation implications for *G. frivaldii*.

Materials and methods

The studied species

According to available literature sources, herbarium specimens as well as based on our own field data, in Kosovo there are four native *Gymnadenia* species. This study deals with: *G. conopsea* (L.) R. Br., *G. frivaldii* Hampe ex Griseb., *G. nigra* (L.) Rchb.f., and *G. odoratissima* (L.) Rich.

In this context, it is important to briefly discuss the taxonomic position of the species *Gymnadenia nigra* (L.) Rchb.f. Based on a study of this species by Teppner and Klein (1990), it was found that the natural distribution of *G. nigra* [homotypic synonym: *Nigritella nigra* (L.) Rchb. p.] is only in Scandinavia. Whereas in the Balkans *G. nigra* has been repeatedly erroneously reported and these specimens are in fact: *Gymnadenia rhellicani* (Teppner & E.Klein) Teppner & E.Klein [homotypic synonym: *Nigritella rhellicani* Teppner & E.Klein]. However, in the Euro+Med Plant Base (Euro + Med 2006+), on which we relied for the current study, such a conclusion is not yet supported. Consequently, we referred to the species as: *G. nigra*.

Revision of herbarium material and distribution data

In total, 179 herbarium specimens (from the Herbarium of the Faculty of Natural Sciences, University of Prishtina) as well as private herbarium collection of F. Rexhepi (41 specimens) – (see Appendix 2 for details) were studied; the majority of these samples were collected by our team during the compilation of the Red Book of the vascular flora of the Republic of Kosovo (Millaku et al. 2013) between 2009 and 2013.

Due to the fact that during the work for the Red Book, the main focus were certain natural habitats that were rich in endemic plants, some regions of the country remained poorly sampled. To compensate for this, we have conducted twenty-five additional expeditions (between 2014 and 2020) to those poorly explored areas, in order to be more confident that the presented data will allow for general conclusions about the investigated genus in Kosovo.

Plant samples were finally identified by F. Millaku, using identification keys and other relevant literature sources (Diklić 1976; Gölz and Reinhard 1986; Tutin 2010).

To establish the distribution of *Gymnadenia* species in Kosovo, the literature was extensively examined (Lakušić and Grgić 1971; Diklić 1976; Rexhepi 1986; Krivošej 1997; Ranđelović et al. 1998; Millaku 1999; Stevanović ed. 1999; Micevski 2001; Bateman et al. 2006; Millaku ed. 2013; Ponert 2014; Djordjević et al. 2017). Determining the habitat type(s) for each species was done by comparing the habitat data where the species was recorded (from herbarium, literature and relevés) and finding the corresponding EUNIS habitat(s) according to Davies et al. (2004).

Vegetation data

To gain an overview of where the studied *Gymnadenia* species grow, in terms of phytosociological plant communities and certain related ecological preferences, a total of 15 phytosociological relevés were made (Appendix 1). Based on our field experience as well as from general knowledge from plant ecology, efforts have been made to conduct appropriate and representative phytosociological relevés.

Standard principles and methods of the Zürich-Montpellier school (Braun-Blanquet 1964; Mueller-Dombois and Ellenberg 1974) were applied. Depending on the habitat type, plot sizes of 10 × 10 m and 5 × 10 m respectively were used. For each plot, a complete list of vascular plants was recorded, alongside with cover-abundance values on a five-degree scale (Braun-Blanquet 1932). For the nomenclature of plant taxa, the Euro+Med Plant Base (Euro+Med 2006+) was followed. Relevés were made at elevations ranging from 140 to 2501 m a.s.l.; four relevés were made on communities with *G. conopsea*, four relevés on communities with *G. frivaldii*, four relevés on communities with *G. nigra* and three relevés on communities with *G. odoratissima*.

Based on diagnostic species, efforts have been made to offer a syntaxonomical classification of these relevés up to the level of Alliance. For this purpose, Mucina et al. (2016), Rexhepi (1994) and Sarić and Kojić (1984) were followed.

Data analysis

Using data obtained from herbarium specimens, phytosociological relevés as well as from literature, we were able to analyze the following parameters: altitude preferences, a set of ecological values (nutrients, pH reaction, moisture, continentality, temperature and light) from accompanying species of plants, using Pignatti indicator values (Pignatti et al. 2005). EUNIS corresponding natural habitat types (Davies et al. 2004) were defined for each species. Additionally, data on the overall species richness (from relevés) and richness of endemic taxa were compared. All of the geographical distributional data were mapped to show the distribution of *Gymnadenia* species in Kosovo (Fig. 1). R software (R Core Team 2013) for statistical computing was used to do the comparative analysis and generate the graphs.

Results

Distribution of *Gymnadenia* species in Kosovo based on herbarium and field data

Based on the studied herbarium specimens, data collected from field surveys as well as literature sources, the presence of four *Gymnadenia* species is confirmed in a total of 88 different localities across Kosovo.

Within these localities, *G. conopsea* is clearly the most abundant species. Its presence has been confirmed in 60 localities and considering its ecological preferences, the species

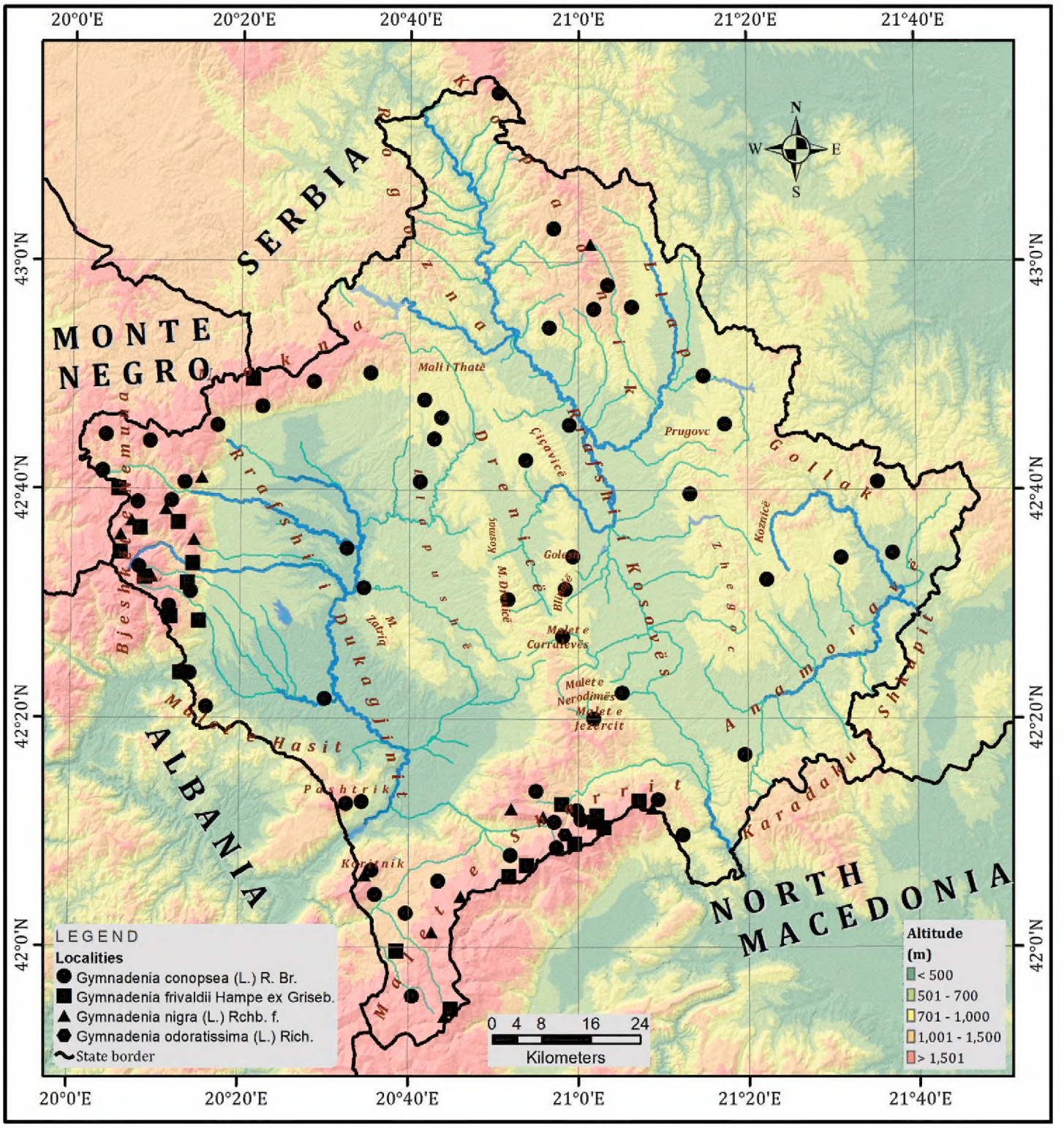

Figure 1. Known distribution of *Gymnadenia* species in Kosovo, based on herbarium specimens, as well as phytosociological relevés.

may have an even broader distribution across the country. *Gymnadenia nigra* is confirmed in 28 localities while *G. frivaldii* in 26 localities in Kosovo. *Gymnadenia odoratissima* is known so far to be present in only one locality in Kosovo (Appendix 2, Fig. 1).

Ecological characteristics and species preferences

Based on the obtained data from 15 phytosociological relevés, general data on each species preferences were evident. In terms of species distribution at different elevations, it was ascertained that the studied species show a narrow distributional preference (Fig. 2). It was established that *G. conopsea* had a preference for lower altitudes

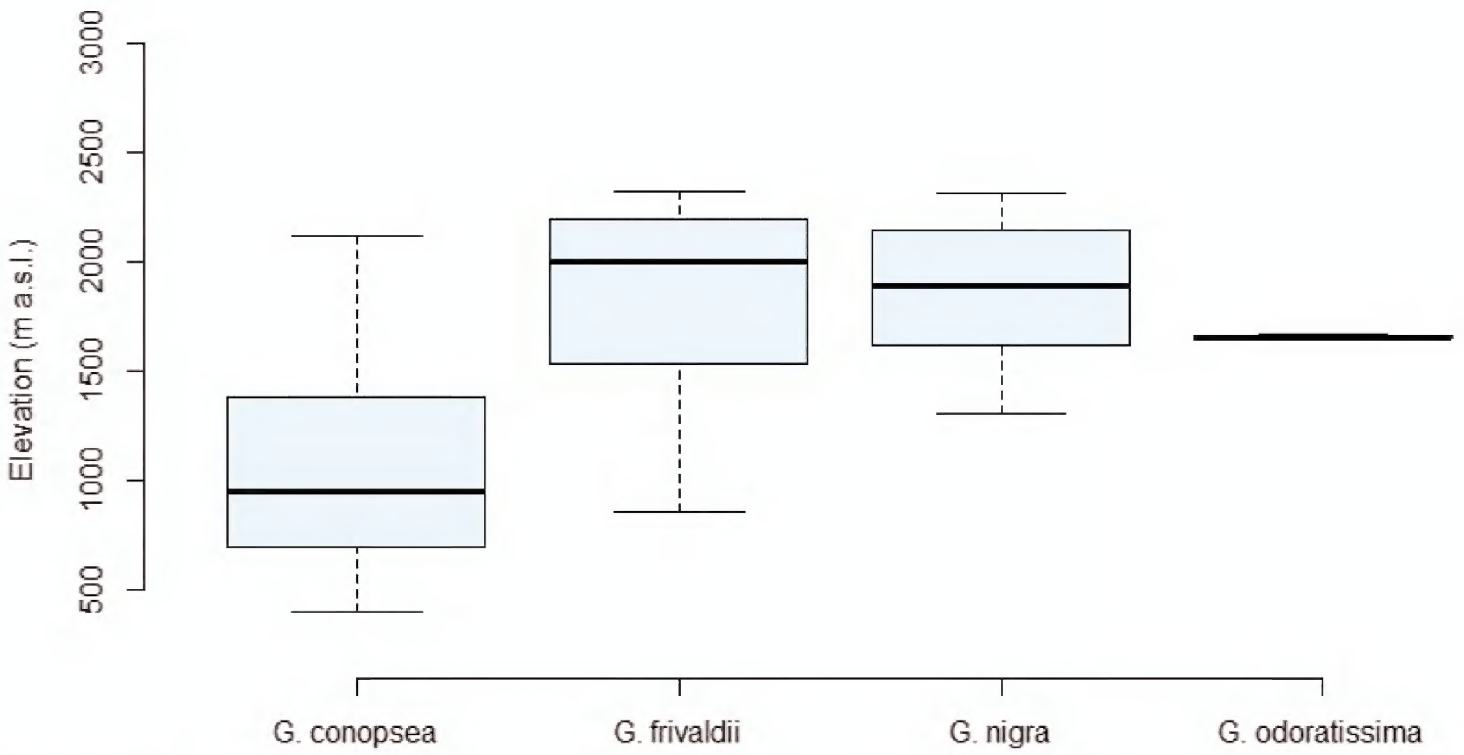

Figure 2. Elevational distribution of four *Gymnadenia* species based on the study of 179 herbarium specimens, geographically located in Kosovo.

(<1000 m a.s.l.), though it had a wider distributional range. *Gymnadenia frivaldii* showed a greater preference for higher altitudes (>2100 m a.s.l.) and had a wider distribution range compared to *G. nigra*. As for *G. odoratissima*, this parameter shows a narrow median weight due to the fact that is known from a single locality at ~1700 m a.s.l.

Concerning soil fertility and nutrients availability, it was established that all four *Gymnadenia* species communities grow on relatively poor soils, with an average value of 3. In this context, *G. nigra* communities can be distinguished with the lowest median weight compared to *G. frivaldii* and G. *odoratissima* that prefer slightly more nitrogen rich soils (Fig. 3, boxplot 1). As for soil pH reaction (Fig. 3, boxplot 2), it was observed that four studied species communities have a general preference for alkaline soils. Though six relevés were made on silicate soils, the occasionally deep, accumulated soil has a significant effect on reducing acidic influence of soil pH. In terms of soil moisture (Fig. 3, boxplot 3), it was established that plant communities of the four *Gymnadenia* species have a general preference for medium-wet soils, with *G. frivaldii* in particular, preferring wetter soils. With regard to climate-continentallity (C) values, it was clear that there are no oceanic species and the average (Fig. 3, boxplot 4) value of 5 is general for all studied species communities. The temperature (T) preferences (Fig. 3, boxplot 5) associate also with the community occurrences at respective elevations above sea level. But, additionally it relates to cold or warm habitats of Europe. In this context, apparent distinction in preferences has been observed namely between communities of *G. conopsea* (6) and *G. nigra* (3). As for light preferences (Fig. 3, boxplot 6), it was obvious that all studied communities have a clear preference for growing under full light, a preference particularly pronounced in the case of *G. nigra*.

Regarding general species richness of all plant communities of the four respective species (Fig. 4, boxplot 1), communities of *G. nigra* and *G. odoratissima* were

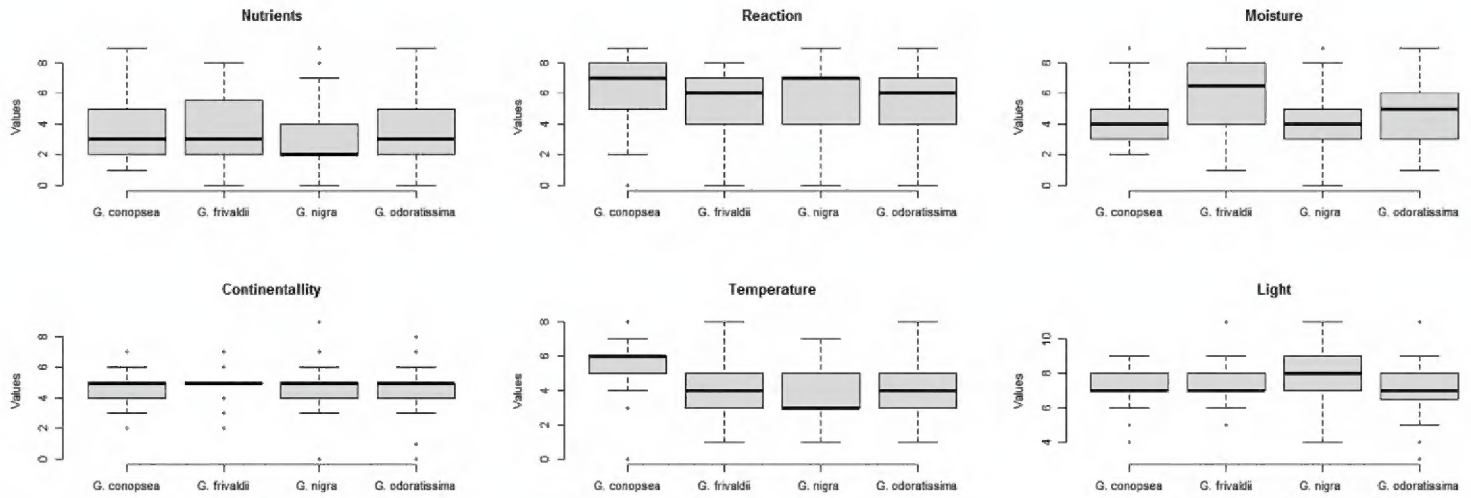

Figure 3. Boxplots representing the ecological preferences for nutrients, pH reaction, moisture, continentality, temperature and light–for four studied *Gymnadenia* species, based on their phytosociological communities.

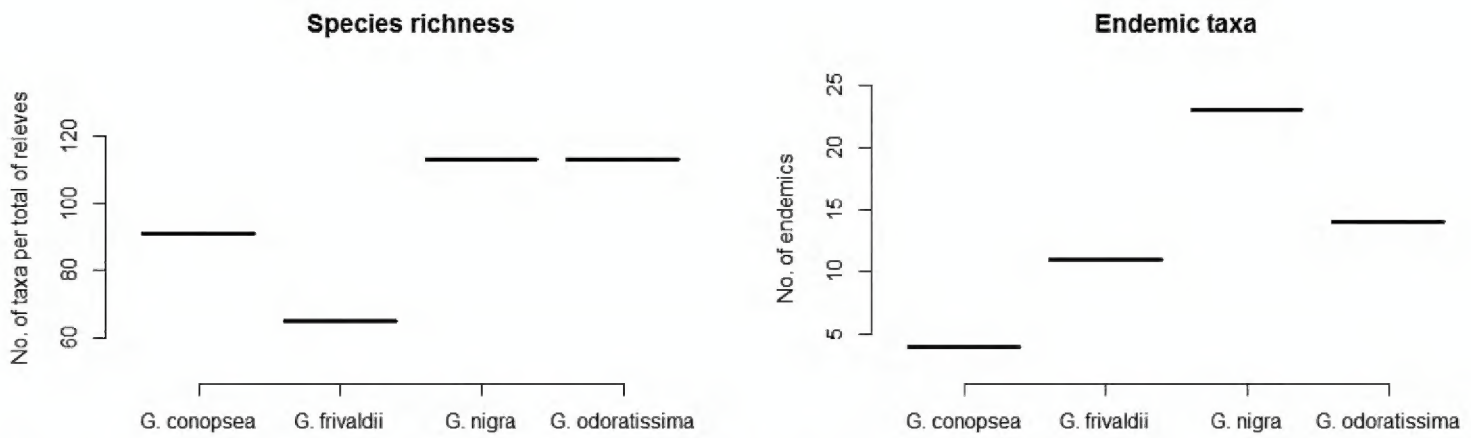

Figure 4. Comparative data on species richness and richness in endemic taxa beween the plant communities of four *Gymnadenia* species in Kosovo.

particularly distinguished by a large number of plant species. The other analyzed parameter, the number of endemic plant taxa per plant communities of a species, showed that plant communities of *G. nigra* (Fig. 4, boxplot 2) were particularly rich in endemics, while those of *G. conopsea* are notably poor. In this regard, *G. frivaldii* communities were rich in endemics too.

Vegetation characteristics

From 15 phytosociological relevés, after syntaxonomical analysis (relying on differential/characteristic species), it was noted that they belong to six different Classes (Appendix 1), with *Elyno-Seslerietea* Br.-Bl. 1948 (Class of vegetation that entails swards of Alpine and subalpine ranges of Europe) being the most abundant, in terms of relevé numbers.

Four relevés were made with *G. conopsea* communities. Three relevés fall into the alliance *Chrysopogono-Danthonion calycinae* Kojić 1959 (Dry grasslands on deep soils) and the other one into the alliance *Trifolion resupinati* Micevski 1957 (Vegetation of wet meadows).

Four relevés were made with *G. frivaldii* communities. As related with its typical natural habitats, the recorded plant communities (3) belonged to the alliance *Narthecion scardici* Horvat ex Lakušić 1968 (Relict moderately-rich fens of the Balkans) and the remaining one belongs to the alliance *Cirsion appendiculati* Horvat et al. 1937 (Tall-herb vegetation on acidic soils along mountain streams).

Additional four relevés were made with plant communities of *G. nigra*. They all fell into the alliance *Seslerio juncifoliae-Caricion firmae* Trinajstić 2005 (Alpine calcicolous sedge swards in wind-exposed habitats in the alpine belt of the Illyrian region and the Northern Dinarides). These four relevés were characterized by an exceptionally high number of associated endemic plant taxa (Fig. 4, boxplot 2).

Finally, a set of three relevés were made with plant communities where also *G. odoratissima* was growing. Due to a confined habitat (in Maja e Zezë, Sharri Mts.), it was quite difficult to record the relevé data. Two of these relevés, after analysis have shown affiliation to the alliance *Cirsion appendiculati* Horvat et al. 1937 (tall-herb vegetation on acidic soils along mountain streams and water springs at high altitudes), while the third one belonged to the alliance *Epilobion angustifolii* Oberd. 1957 (tall-herb perennial semi-natural vegetation on acidic soils of forest margins).

Discussion

Distributional patterns, habitat type and general environmental characteristics

As expected, all four species of the genus *Gymnadenia* follow different distribution patterns in Kosovo. *Gymnadenia conopsea* is a widely distributed species in Europe. In south-eastern Europe, it is common in the Carpathians, Hungary, Romania, the Balkan Peninsula and up to southern Russian and Ukrainian peninsula of Crimea. In all of these areas, it tends to occur at higher elevations, usually >800 m a.s.l. (Meekers et al. 2012). In Kosovo it represents the most common species of the genus. It was recorded in different habitats ranging from 750 m up to 1550 m a.s.l. As we had records on silicate as well as calcareous substrates, it indicates that this species can successfully grow in either one of these substrate types. Due to the wide distribution of the species, we are convinced that especially *G. conopsea* must have an even wider distribution than we depict on the map (Fig. 1). From the available data, it was confirmed in the following EUNIS Habitat types in Kosovo: E2.1 Permanent mesotrophic pastures and aftermath-grazed meadows; E3.3 Sub-mediterranean humid meadows; E1.2 Perennial calcareous grassland and basic steppes; E1.7 Non-Mediterranean dry acid and neutral closed grassland; E1.73 *Deschampsia flexuosa* grasslands; E4.31 Alpic *Nardus stricta* swards and related communities; and E4.4 Calcareous alpine and subalpine grassland.

From this genus in Kosovo, undoubtedly one of the rarest and most fragile species is the Balkan endemic *G. frivaldii*. It is worth noting that this species previously has been assigned to the genus *Pseudorchis* Ség. (syn.: *Leucorchis* E.May) and just recently, molecular based analysis has confirmed that it belongs to the genus *Gymnadenia*

(Bateman et al. 2003). *Gymnadenia frivaldii* is a species with a relatively small range in Europe limited to high-mountain belts on the Carpathians and the central and eastern Balkans (Delforge 2006). It has been reported for Albania, Kosovo, North Macedonia, Greece, Romania, Bulgaria, Montenegro, and Serbia (Diklić 1976; Bateman et al. 2006; Millaku ed. 2013, Djordjević et al. 2016, 2017; Berisha et al. 2020). This species prefers to grow on silicate substrates in fen communities and wet meadows of subalpine and alpine areas; occasionally it has also been recorded in pastures (of calcareous substrates too) as well as shrubs of the same altitudes in the mountains (Millaku ed. 2013). It has been reported (Djordjević et al. 2016) that this species is an indicator of an entire class (*Scheuchzerio palustris-Caricetea fuscae* Tx. 1937) of sedge-moss vegetation of fens in our region. The elevation distributional range was 1500–2600 m a.s.l. From the available data, mainly from the herbarium specimens, it was confirmed in the following EUNIS Habitat types in Kosovo: D2.2 Poor fens and soft-water spring mires; D2.22 *Carex nigra*, *Carex canescens*, *Carex echinata* fens; D2.26 *Eriophorum angustifolium* fens; D2.282 Balkan *Willemetia* fens; D2.3 Transition mires and quaking bogs and D2.38 *Sphagnum* and *Eriophorum* rafts.

Gymnadenia nigra was recorded on calcareous substrates of sub-alpine and alpine grasslands, or almost on all mountains exceeding 2000 m a.s.l. Based on the available data, it was confirmed in the following EUNIS Habitat types in Kosovo: E4.4 Calcareous alpine and subalpine grasslands; E1.7 Non-Mediterranean dry acid and neutral closed grassland and E1.72 *Agrostis-Festuca* grassland. All four relevés (Appendix 1) with this species, syntaxonomically fall into the Alliance: *Seslerio juncifoliae-Caricion firmae* Trinajstić 2005 (Alpine calcicolous sedge swards in wind-exposed habitats), though it has been reported also in different plant communities growing on limestone substrates (Rexhepi 1994). Also *G. nigra* previously has been assigned to *Nigritella* Rich. and *Orchis* Tourn. ex L., but phylogenetic studies (Bateman et al. 2003) have proved that it belongs to the genus *Gymnadenia*.

Gymnadenia odoratissima, a species very similar to *G. conopsea*, has an extensive distribution range in Europe. It is recorded from Spain in the west up to Ukraine in the east. Common in the mountain ranges of central Europe, up to the Sweden in the north and has been recorded also in Greece to the south. In Kosovo, Maja e Zezë massif represents the only known habitat of this species. It was recorded on silicate substrate, scattered in an area of ~1700 m^2, at an elevation ranging from 1680 m up to 1800 m a.s.l. Its corresponding habitat type was that of (EUNIS - E5.5721) Moesian Balkan thistle tall herb communities, and at the forest (rather degraded) margins of (EUNIS - G1.6933), namely the Balkan range subalpine beech forests.

Vegetation analysis

Of the four relevés with *G. conopsea* (Relevés 1–4, Appendix 1), relevés 1, 3 and 4 belonged to the Alliance: *Chrysopogono-Danthonion calycinae* Kojić 1959, with the following species being dominant: *Polygala major* Jacq., *Hypochaeris maculata* L., *Festuca nigrescens* Lam., *Danthonia alpina* Vest. and *Sanguisorba minor* Scop. The richest relevé in

terms of number of plant taxa was relevé no. 4., with 36 recorded plant taxa. Relevé no. 2 belonged to the Alliance: *Trifolion resupinati* Micevski 1957. It was recorded at a lower elevation (140 m) compared with the other ones of this group. The most dominant species in this relevé were: *Hordeum secalinum* Schreb. and *Trifolium fragiferum* L. As it is known, *G. conopsea* has a wider, more complex distributional range, though we aimed at offering its most common plant communities for comparative reasons. It was not our aim to define its syntaxonomical status, though this study can assist in that matter.

Of the four relevés with *G. frivaldii* (Relevés 5–8, Appendix 1), relevés 5, 6 and 8 belonged to the Alliance: *Narthecion scardici* Horvat ex Lakušić 1968. In these three calcareous relevés, the following plant taxa have been recorded as dominant ones: *Narthecium scardicum* Košanin, *Pinguicula balcanica* Casper, *Gymnadenia frivaldii* Hampe ex Griseb., *Eriophorum angustifolium* Honck. and *Pinguicula leptoceras* Rchb. Relevé no. 7 belonged to the Alliance: *Cirsion appendiculati* Horvat et al. (1937) based on its differential taxa. The most dominant plant taxa were: *Cirsium appendiculatum* Griseb., *Eriophorum angustifolium* Honck., *Agrostis canina* L. and *Caltha palustris* L. With a total of 31 recorded plant taxa, this was the relevé with the richest floristic diversity.

All four relevés with *G. nigra* (Relevés 9–12, Appendix 1) shared similar characteristics as they were all recorded on calcareous substrates. They all belonged to the alliance: *Seslerio juncifoliae-Caricion firmae* Trinajstić 2005, and the following taxa were recorded as dominant ones: *Helianthemum nummularium* (L.) Mill., *Dryas octopetala* L., *Oxytropis jacquinii* Bunge, *Helianthemum canum* (L.) Baumg., *Bistorta vivipara* (L.) Delarbre and *Gymnadenia nigra* (L.) Rchb.f. All relevés with *G. nigra* had high number of recorded plant taxa, with relevé no. 10 having 72 plant taxa recorded on one sampling site.

Of the three relevés with *G. odoratissima* (Relevés 13–15, Appendix 1), relevés 13 and 14 most likely should belong to the Alliance: *Cirsion appendiculati* Horvat et al. (1937), with the following taxa recorded as dominant ones: *Barbarea balcana* Pančić, *Eriophorum latifolium* Hoppe, *Caltha palustris* L., *Cirsium appendiculatum* Griseb., *Cardamine pratensis* L., and *Helianthemum nummularium* (L.) Mill. While the other remaining relevé on silicates (relevé no. 15) most likely should belong to the Alliance: *Epilobion angustifolii* Oberd. 1957. *Epilobium angustifolium* L. is the most dominant plant taxon in this relevé, as a characteristic species for the forest edges on silicate as well as a potential indicator of previously burned habitats or man-induced deforestation. High cover-abundance values on this relevé had also: *Salix caprea* L., *Pimpinella saxifraga* L. and *Avenella flexuosa* (L.) Drejer.

In the context of the vegetation diversity assessment, from only 15 relevés it was noticeable a very diverse vegetation affiliation by these four species of *Gymnadenia*. Four relevés belonged to *Elyno-Seslerietea*, three relevés to *Festuco-Brometea*, *Scheuchzerio palustris-Caricetea fuscae* and *Mulgedio-Aconitetea* respectively, and finally one releve belonged to *Epilobietea angustifolii* and *Molinio-Arrhenatheretea* respectively.

Commonly, all strategies for measuring biodiversity involve protecting a single species or several species of a given genus. Vegetation ecology contributes towards a better understanding of species indices of threats and a variety of interrelated paradigms

in ecology (Cornell and Karlson 1996; Austin 1999). Furthermore, it also gives an incomparable insight into understanding the complex relationships between plant diversity, vegetation cover and site conditions (Wiesmair et al. 2017).

Conservation aspects

Although all of the four investigated *Gymnadenia* species are included in the European Red List of Vascular Plants (Bilz et al. 2011), all categorized as "LC" [Least Concern], more attention should be paid to those species that are more vulnerable and have fragmented habitats.

From this point of view, *G. frivaldii* is characterized by limited populations and a small number of mature individuals, with the exception of those in the Mts. of Gjeravica and Dobrosh. Nonetheless, since species populations are observed to be stable, its categorization as Near Threatened [NT] (Millaku ed. 2013) in Kosovo is completely reasonable.

Due to the large number of associated endemic species and their importance, we suggest that *G. nigra* populations in Kosovo also be assessed against conservation criteria and that monitoring measures be taken. In addition, the single population of *G. odoratissima* should be carefully monitored, as it represents the only habitat of the species in Kosovo.

Conclusions

Like all members of the Orchidaceae, *Gymnadenia* species are under pressure in the wild, primarily for their ornamental merits. These species also face many other threats in the wild, but are mainly affected by the loss, degradation or increasing fragmentation of their natural habitats. This habitat fragmentation is caused by human impacts on the natural environment.

Due to the fact that populations of *G. frivaldii* grow in habitats near watercourses and wet meadows, the conservation and management of these resources is directly related to the sustainability of the habitats that host them and many accompanying species.

The data presented in this study can help in the decision-making processes of the relevant agencies to implement appropriate conservation programs as well as further research.

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Appendix I

Phytosociological table of 15relevès. Species of *Gymnadenia* shown in bold and with grey shaded background.

Relevé syntaxonomic categories – (Class, Order and **Alliance)**	ALL: **Chrysopogono-Danthonion calycinae** Kojić 1959 [Cl.: Festuco-Brometea / Ord.: Brachypodietalia pinnati]	ALL: **Trifolion resupinati** Micevski 1957 [Cl.: Molinio-Arrhenatheretea / Ord.: Trifolio-Hordeetalia]	ALL: **Chrysopogono-Danthonion calycinae** Kojić 1959 [Cl.: Festuco-Brometea / Ord.: Brachypodietalia pinnati]	ALL: **Chrysopogono-Danthonion calycinae** Kojić 1959 [Cl.: Festuco-Brometea / Ord.: Brachypodietalia pinnati]	ALL: **Narthecion scardici** Horvat ex Lakušić 1968 [Cl.: Scheuchzerio palustris-Caricetea fuscae / Ord.: Caricetalia fuscae]	ALL: **Narthecion scardici** Horvat ex Lakušić 1968 [Cl.: Scheuchzerio palustris-Caricetea fuscae / Ord.: Caricetalia fuscae]	ALL: **Cirsion appendiculati** Horvat et al. 1937 [Cl.: Mulgedio-Aconitetea / Ord.: Adenostyletalia alliariae]	ALL: **Narthecion scardici** Horvat ex Lakušić 1968 [Cl.: Scheuchzerio palustris-Caricetea fuscae / Ord.: Caricetalia fuscae]	ALL: **Seslerio juncifoliae-Caricion firmae** Trinajstić 2005 [Cl.: Elyno-Seslerietea / Ord.: Seslerietalia tenuifoliae]	ALL: **Seslerio juncifoliae-Caricion firmae** Trinajstić 2005 [Cl.: Elyno-Seslerietea / Ord.: Seslerietalia tenuifoliae]	ALL: **Seslerio juncifoliae-Caricion firmae** Trinajstić 2005 [Cl.: Elyno-Seslerietea / Ord.: Seslerietalia tenuifoliae]	ALL: **Seslerio juncifoliae-Caricion firmae** Trinajstić 2005 [Cl.: Elyno-Seslerietea / Ord.: Seslerietalia tenuifoliae]	ALL: **Cirsion appendiculati** Horvat et al. 1937 [Cl.: Mulgedio-Aconitetea / Ord.: Adenostyletalia alliariae]	ALL: **Cirsion appendiculati** Horvat et al. 1937 [Cl.: Mulgedio-Aconitetea / Ord.: Adenostyletalia alliariae]	ALL: **Epilobion angustifolii** Oberd. 1957 [Cl.: Epilobietea angustifolii / Ord.: Galeopsio-Senecionetalia sylvatici]
Number of relevé	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Plot area (m^2)	100	100	100	100	50	50	50	50	100	100	100	100	50	50	50
Inclination in degree	10	2	10	15	12	5	15	10	12	10	15	12	10	12	10
Exposition	W	SE	NW	S	SW	N	SE	NW	NW	N	NE	SE	SE	NE	N
Altitude (m.a.s.l)	1400	140	800	1510	1509	2234	1847	1622	2501	1836	2324	2142	1696	1758	1710
Covering (%)	95	100	95	90	98	98	98	95	100	98	90	95	90	95	90
Substrate	Silicate	Limest.	Silicate	Limest.	Limest.	Limest.	Silicate	Limest.	Limest.	Limest.	Limest.	Limest.	Silicate	Silicate	Silicate
Locality	Kopaonik	Ferizaj	Orllan	Brezovicë	Vracë	Jazhincë	Luboten	B. e Dobroshit	Maja e Zezë	Luboten	Kurvallë	Zhleb	Maja e Zezë	Maja e Zezë	Maja e Zezë
Date	04.07.2017	25.06.2017	30.06.2018	09.07.2018	21.06.2019	30.06.2019	15.07.2019	20.07.2020	30.06.2019	08.07.2019	14.07.2019	20.07.2019	15.06.2019	15.06.2019	15.06.2019
No. of species / relevé	30	35	27	36	28	27	31	28	67	72	42	48	62	64	55
GPS Coordinates	43°14'57.30"N, 20°48'37.57"E	42°19'40.34"N, 21°10'48.39"E	42°49'17.44"N, 21°20'57.54"E	42°12'2.15"N, 21°1'53.69"E	41°54'47.34"N, 20°43'49.72"E	42°8'57.42"N, 20°59'38.81"E	42°12.905N, 021°08.234E	42°34'6.06"N, 20°14'31.25"E	42°3'49.68"N, 20°45'56.99"E	42°13.115N, 21°08.002E	42°31'35.30"N, 20°8'40.73"E	42°46'7.35"N, 20°15'51.18"E	42°6'41.5"N, 20°52'46.2"E	42°6'44.9"N, 20°53'19.9"E	42°6'43.0"N, 20°52'27.1"E
Polygala major Jacq.	2	.	.	.	.	.	.	.	.	.	.	1	.	.	.
Thymus praecox subsp. *jankae* (Čelak.) Jalas	1	.	.	1	.	.	.	.	.	.	.	.	.	.	.
Pedicularis heterodonta Pančić	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hypochaeris maculata L.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Dianthus cruentus Griseb.	+	.	1	.	.	.	.	.	.	.	.	1	.	.	.
Anthyllis vulneraria L.	1	.	.	4	.	.	.	.	.	.	.	.	.	.	.
Plantago media L.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.
***Gymnadenia conopsea* (L.) R.Br.**	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.
Scabiosa columbaria L.	1	.	.	.	.	.	.	.	+	+	+	.	.	.	.
Leontodon hispidus L.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anacamptis morio (L.) R.M.Bateman & al.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Festuca nigrescens Lam.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Relevé syntaxonomic categories – (Class, Order and **Alliance**)	ALL: **Chrysopogono-Danthonion calycinae** Kojić 1959 [Cl.: Festuco-Brometea / Ord.: Brachypodietalia pinnati]	ALL: **Trifolion resupinati** Micevski 1957 [Cl.: Molinio-Arrhenatheretea / Ord.: Trifolio-Hordeetalia]	ALL: **Chrysopogono-Danthonion calycinae** Kojić 1959 [Cl.: Festuco-Brometea / Ord.: Brachypodietalia pinnati]	ALL: **Chrysopogono-Danthonion calycinae** Kojić 1959 [Cl.: Festuco-Brometea / Ord.: Brachypodietalia pinnati]	ALL: **Narthecion scardici** Horvat ex Lakušić 1968 [Cl.: Scheuchzerio palustris-Caricetea fuscae / Ord.: Caricetalia fuscae]	ALL: **Narthecion scardici** Horvat ex Lakušić 1968 [Cl.: Scheuchzerio palustris-Caricetea fuscae / Ord.: Caricetalia fuscae]	ALL: **Cirsion appendiculati** Horvat et al. 1937 [Cl.: Mulgedio-Aconitetea / Ord.: Adenostyletalia alliariae]	ALL: **Narthecion scardici** Horvat ex Lakušić 1968 [Cl.: Scheuchzerio palustris-Caricetea fuscae / Ord.: Caricetalia fuscae]	ALL: **Seslerio juncifoliae-Caricion firmae** Trinajstić 2005 [Cl.: Elyno-Seslerietea / Ord.: Seslerietalia tenuifoliae]	ALL: **Seslerio juncifoliae-Caricion firmae** Trinajstić 2005 [Cl.: Elyno-Seslerietea / Ord.: Seslerietalia tenuifoliae]	ALL: **Seslerio juncifoliae-Caricion firmae** Trinajstić 2005 [Cl.: Elyno-Seslerietea / Ord.: Seslerietalia tenuifoliae]	ALL: **Seslerio juncifoliae-Caricion firmae** Trinajstić 2005 [Cl.: Elyno-Seslerietea / Ord.: Seslerietalia tenuifoliae]	ALL: **Cirsion appendiculati** Horvat et al. 1937 [Cl.: Mulgedio-Aconitetea / Ord.: Adenostyletalia alliariae]	ALL: **Cirsion appendiculati** Horvat et al. 1937 [Cl.: Mulgedio-Aconitetea / Ord.: Adenostyletalia alliariae]	ALL: **Epilobion angustifolii** Oberd. 1957 [Cl.: Epilobietea angustifolii / Ord.: Galeopsio-Senecionetalia sylvatici]
Asperula cynanchica L.	1	.	.	2	.	.	.	.	+	+	+	+	.	.	.
Trifolium pratense L.	1	.	+	1	.	.	.	.	.	.	.	.	.	.	+
Campanula patula L.	1	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Rumex acetosa L.	+	.	.	.	.	.	.	.	+	.	.	.	+	+	.
Rhinanthus minor L.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Gentianella bulgarica (Velen.) Holub	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Genista sagittalis L.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Euphrasia rostkoviana Hayne	1	.	.	.	.	.	.	.	+	+	.	+	.	.	.
Avenella flexuosa (L.) Drejer	1	.	.	+	.	.	.	.	.	.	.	.	.	.	1
Pilosella hoppeana (Schult.) F.W.Schultz & Sch.Bip.	1	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Veratrum album L.	+	.	.	.	+	.	.	+	.	.	.	.	.	.	.
Gentiana utriculosa L.	+	.	.	.	.	.	.	.	+	+	+	+	.	.	.
Antennaria dioica (L.) Gaertn.	+	.	.	.	.	.	.	.	+	+	+	.	.	.	.
Silene viscaria (L.) Jess.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ranunculus montanus Willd.	1	.	.	1	.	.	.	.	.	.	.	+	.	.	.
Briza media L.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.
Lotus corniculatus L.	+	1	+	+	.	.	.	.	+	+	.	.	.	.	.
Genista tinctoria L.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Hordeum secalinum Schreb.	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium fragiferum L.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.
Poa trivialis subsp. *sylvicola* (Guss.) H.Lindb.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.
Ranunculus sardous Crantz	.	2	.	+	.	.	.	.	.	.	.	.	.	.	.
Alopecurus utriculatus Sol.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.
Oenanthe silaifolia M.Bieb.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium patens Schreb.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Bromus racemosus L.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Potentilla reptans L.	.	1	.	+	.	.	.	.	.	.	.	.	.	.	.
Schedonorus pratensis (Huds.) P.Beauv.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium repens L.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.
Ranunculus acris L.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Lolium perenne L.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.

Relevé syntaxonomic categories – (Class, Order and **Alliance)**	*Carex vulpina* L.	*Alopecurus pratensis* L.	*Verbena officinalis* L.	*Anthoxanthum odoratum* L.	*Carex melanostachya* Willd.	*Mentha aquatica* L.	*Cichorium intybus* L.	*Rorippa sylvestris* (L.) Besser	*Cirsium arvense* (L.) Scop.	*Inula salicina* L.	*Galium palustre* L.	*Carex divisa* Huds.	*Medicago lupulina* L.	*Poa pratensis* L.	*Prunella vulgaris* L.	*Poa compressa* L.	*Lysimachia nummularia* L.	*Carex distans* L.	*Poa palustris* L.	*Danthonia alpina* Vest	*Inula hirta* L.	*Euphrasia stricta* J.F.Lehm.	*Trifolium montanum* L.	*Polygala comosa* Schkuhr	*Luzula campestris* (L.) DC.	*Filipendula vulgaris* Moench	*Leucanthemum vulgare* Lam.	*Helianthemum nummularium* subsp. *grandiflorum* (Scop.) Schinz & Thell.	*Brachypodium phoenicoides* (L.) Roem. & Schult.	*Eryngium campestre* L.
ALL: **Chrysopogono-Danthonion calycinae** Kojić 1959 [Cl.: Festuco-Brometea / Ord.: Brachypodietalia pinnati]	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ALL: **Trifolion resupinati** Micevski 1957 [Cl.: Molinio-Arrhenatheretea / Ord.: Trifolio-Hordeetalia]	.	+	+	1	.	.	.	.	.	+	.	.	.	+	.	.	.	+	+	.	3	.	.	.	.	.	1	.	.	.	.
ALL: **Chrysopogono-Danthonion calycinae** Kojić 1959 [Cl.: Festuco-Brometea / Ord.: Brachypodietalia pinnati]	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.
ALL: **Chrysopogono-Danthonion calycinae** Kojić 1959 [Cl.: Festuco-Brometea / Ord.: Brachypodietalia pinnati]	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ALL: **Narthecion scardici** Horvat ex Lakušić 1968 [Cl.: Scheuchzerio palustris-Caricetea fuscae / Ord.: Caricetalia fuscae]	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ALL: **Narthecion scardici** Horvat ex Lakušić 1968 [Cl.: Scheuchzerio palustris-Caricetea fuscae / Ord.: Caricetalia fuscae]	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ALL: **Cirsion appendiculati** Horvat et al. 1937 [Cl.: Mulgedio-Aconitetea / Ord.: Adenostyletalia alliariae]	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
ALL: **Narthecion scardici** Horvat ex Lakušić 1968 [Cl.: Scheuchzerio palustris-Caricetea fuscae / Ord.: Caricetalia fuscae]	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ALL: **Seslerio juncifoliae-Caricion firmae** Trinajstić 2005 [Cl.: Elyno-Seslerietea / Ord.: Seslerietalia tenuifoliae]	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
ALL: **Seslerio juncifoliae-Caricion firmae** Trinajstić 2005 [Cl.: Elyno-Seslerietea / Ord.: Seslerietalia tenuifoliae]	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ALL: **Seslerio juncifoliae-Caricion firmae** Trinajstić 2005 [Cl.: Elyno-Seslerietea / Ord.: Seslerietalia tenuifoliae]	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ALL: **Seslerio juncifoliae-Caricion firmae** Trinajstić 2005 [Cl.: Elyno-Seslerietea / Ord.: Seslerietalia tenuifoliae]	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
ALL: **Cirsion appendiculati** Horvat et al. 1937 [Cl.: Mulgedio-Aconitetea / Ord.: Adenostyletalia alliariae]	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ALL: **Cirsion appendiculati** Horvat et al. 1937 [Cl.: Mulgedio-Aconitetea / Ord.: Adenostyletalia alliariae]	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ALL: **Epilobion angustifolii** Oberd. 1957 [Cl.: Epilobietea angustifolii / Ord.: Galeopsio-Senecionetalia sylvatici]	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Relevé syntaxonomic categories – (Class, Order and **Alliance)**	ALL: **Chrysopogono-Danthonion calycinae** Kojić 1959 [Cl.: Festuco-Brometea / Ord.: Brachypodietalia pinnati]	ALL: **Trifolion resupinati** Micevski 1957 [Cl.: Molinio-Arrhenatheretea / Ord.: Trifolio-Hordeetalia]	ALL: **Chrysopogono-Danthonion calycinae** Kojić 1959 [Cl.: Festuco-Brometea / Ord.: Brachypodietalia pinnati]	ALL: **Chrysopogono-Danthonion calycinae** Kojić 1959 [Cl.: Festuco-Brometea / Ord.: Brachypodietalia pinnati]	ALL: **Narthecion scardici** Horvat ex Lakušić 1968 [Cl.: Scheuchzerio palustris-Caricetea fuscae / Ord.: Caricetalia fuscae]	ALL: **Narthecion scardici** Horvat ex Lakušić 1968 [Cl.: Scheuchzerio palustris-Caricetea fuscae / Ord.: Caricetalia fuscae]	ALL: **Cirsion appendiculati** Horvat et al. 1937 [Cl.: Mulgedio-Aconitetea / Ord.: Adenostyletalia alliariae]	ALL: **Narthecion scardici** Horvat ex Lakušić 1968 [Cl.: Scheuchzerio palustris-Caricetea fuscae / Ord.: Caricetalia fuscae]	ALL: **Seslerio juncifoliae-Caricion firmae** Trinajstić 2005 [Cl.: Elyno-Seslerietea / Ord.: Seslerietalia tenuifoliae]	ALL: **Seslerio juncifoliae-Caricion firmae** Trinajstić 2005 [Cl.: Elyno-Seslerietea / Ord.: Seslerietalia tenuifoliae]	ALL: **Seslerio juncifoliae-Caricion firmae** Trinajstić 2005 [Cl.: Elyno-Seslerietea / Ord.: Seslerietalia tenuifoliae]	ALL: **Seslerio juncifoliae-Caricion firmae** Trinajstić 2005 [Cl.: Elyno-Seslerietea / Ord.: Seslerietalia tenuifoliae]	ALL: **Cirsion appendiculati** Horvat et al. 1937 [Cl.: Mulgedio-Aconitetea / Ord.: Adenostyletalia alliariae]	ALL: **Cirsion appendiculati** Horvat et al. 1937 [Cl.: Mulgedio-Aconitetea / Ord.: Adenostyletalia alliariae]	ALL: **Epilobion angustifolii** Oberd. 1957 [Cl.: Epilobietea angustifolii / Ord.: Galeopsio-Senecionetalia sylvatici]
Helictochloa pratensis (L.) Romero Zarco	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Pimpinella saxifraga L.	.	.	+	+	.	+	+	+	.	+	.	+	+	+	1
Galium verum L.	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.
Helleborus odorus Willd.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Linum catharticum L.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Sanguisorba minor Scop.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.
Teucrium chamaedrys L.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
Euphorbia cyparissias L.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Centaurea scabiosa L.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Arabis hirsuta (L.) Scop.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	.
Hypericum perforatum L.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Dactylis glomerata L.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Ptilostemon afer (Jacq.) Greuter	.	.	.	+	.	.	.	.	.	.	.	.			+
Knautia arvensis (L.) DC.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Viola elegantula Schott	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Primula veris L.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+
Stachys officinalis (L.) Trevis.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Carex caryophyllea Latourr.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Narthecium scardicum Košanin	.	.	.	.	2	1	.	1	.	.	.	.	.	+	.
Pinguicula balcanica Casper	.	.	.	.	3	4	+	.	+	.	.	.	+	+	.
Carex nigra (L.) Reichard	.	.	.	.	1	1	.	1	.	.	.	.	1	+	.
***Gymnadenia frivaldii* Hampe ex Griseb.**	.	.	.	.	**1**	**+**	**+**	**2**	.	.	.	.	.	.	.
Juncus triglumis L.	.	.	.	.	1	.	.	+	.	.	.	.	.	.	.
Primula halleri J.F.Gmel.	.	.	.	.	1	+	+	.	.	.	.	.	.	.	.
Silene asterias Griseb.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Willemetia stipitata (Jacq.) Dalla Torre	.	.	.	.	+	1	+	.	.	.	.	.	.	.	.
Dactylorhiza cordigera (Fr.) Soó	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Juncus thomasii Ten.	.	.	.	.	+	.	.	.	.	.	.	.	+	+	.
Trifolium badium Schreb.	.	.	.	.	+	+	+	.	.	+	+	.	.	.	.

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Parnassia palustris L.	.	.	.	.	+	+	+	1	.	.	.	.	.	+	.
Philonotis seriata Mitt.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Eriophorum angustifolium Honck.	.	.	.	.	+	.	2	2	.	.	.	.	.	.	.
Deschampsia cespitosa (L.) P.Beauv.	.	.	.	.	+	+	.	.	.	.	.	.	+	+	.
Eleocharis acicularis (L.) Roem. & Schult.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Carex lepidocarpa Tausch	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Dianthus superbus L.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Carex flava L.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.
Juncus effusus L.	.	.	.	.	+	1	+	1	.	.	.	.	+	+	.
Sanguisorba officinalis L.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.
Blysmus compressus (L.) Link	.	.	.	.	+	+	+	.	.	.	.	.	+	+	.
Iris pseudacorus L.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Agrostis canina L.	.	.	.	.	+	.	1	.	.	.	.	.	+	+	+
Caltha palustris L.	.	.	.	.	+	+	1	+	.	.	.	.	2	2	.
Ranunculus fontanus C.Presl	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Barbarea longirostris Velen.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Cardamine carnosa Waldst. & Kit.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Leontodon crispus Vill.	.	.	.	.	.	1	+	.	+	+	.	.	.	.	+
Carex kitaibeliana Bech.	.	.	.	.	.	+	.	+	2	1	+	.	+	+	+
Nardus stricta L.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Selaginella selaginoides (L.) Schrank & Mart.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Saxifraga rotundifolia L.	.	.	.	.	.	+	+	+	.	.	.	.	+	+	.
Silene pusilla Waldst. & Kit.	.	.	.	.	.	+	.	.	.	.	.	.	+	+	.
Soldanella alpina L.	.	.	.	.	.	+	.	+	.	+	.	.	.	.	.
Crepis aurea subsp. *glabrescens* (Caruel) Arcang.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
Dactylorhiza maculata (L.) Soó	.	.	.	.	.	+	+	.	+	+	.	.	.	.	.
Equisetum palustre L.	.	.	.	.	.	+	.	+	.	.	.	.	+	+	.
Viola aetolica Boiss. & Heldr.	.	.	.	.	.	+	.	.	.	.	.	.	+	+	.
Plantago lanceolata L.	.	.	.	.	.	+	+	.	.	.	.	.	+	+	.

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Cirsium appendiculatum Griseb.	.	.	.	.	.	.	4	.	.	.	.	.	3	2	.
Cardamine pratensis L.	.	.	.	.	.	.	1	2	.	.	.	.	1	1	.
Helianthemum nummularium (L.) Mill.	.	.	.	.	.	.	1	.	.	+	2	4	1	+	+
Carex curvula All.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
Alchemilla hybrida (L.) L.	.	.	.	.	.	.	+	+	.	+	.	.	.	.	+
Geranium sylvaticum L.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Geum coccineum Sibth. & Sm.	.	.	.	.	.	.	+	+	.	.	.	.	+	1	.
Ranunculus breyninus Crantz	.	.	.	.	.	.	+	.	+	+	.	.	+	+	.
Myosotis sylvatica Hoffm.	.	.	.	.	.	.	+	+	.	.	.	.	+	+	.
Calamagrostis varia (Schrad.) Host subsp. *varia*	.	.	.	.	.	.	+	.	.	.	.	.	+	+	.
Mentha longifolia (L.) L.	.	.	.	.	.	.	+	.	.	.	.	.	+	+	.
Festuca adamovicii (St.-Yves) Markgr.-Dann.	.	.	.	.	.	.	+	.	+	+	.	.	+	+	+
Veronica chamaedrys L.	.	.	.	.	.	.	+	+	+	+	+	+	+	+	.
Pedicularis brachyodonta Schloss. & Vuk.	.	.	.	.	.	.	+	.	+	+	+	.	+	+	.
Pinguicula leptoceras Rchb.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.
Ranunculus degenii Kümmerle & Jáv.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
Trollius europaeus L.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Saxifraga stellaris L.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Phyteuma pseudorbiculare Pant.	.	.	.	.	.	.	.	+	.	+	.	.	+	+	.
Neotinea maculata (Desf.) Stearn	.	.	.	.	.	.	.	+	+	.	+	+	.	.	.
Ranunculus platanifolius L.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Bistorta officinalis Delarbre	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
Dryas octopetala L.	.	.	.	.	.	.	.	.	1	4	.	.	.	.	+
Oxytropis jacquinii Bunge	.	.	.	.	.	.	.	.	2	3	.	+	.	.	.
Helianthemum canum (L.) Baumg.	.	.	.	.	.	.	.	.	4	2	.	+	.	.	+
Edraianthus graminifolius (L.) A.DC.	.	.	.	.	.	.	.	.	2	1	+	.	.	.	.

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Juniperus communis subsp. *nana* Syme	.	.	.	.	.	.	.	.	1	+	1	.	.	.	+
Festuca panciciana (Hack.) K.Richt.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+
Bistorta vivipara (L.) Delarbre	.	.	.	.	.	.	.	.	+	+	+	+	+	+	.
Anemonastrum narcissiflorum (L.) Holub	.	.	.	.	.	.	.	.	+	.	+	+	+	.	.
Sesleria nitida Ten.	.	.	.	.	.	.	.	.	+	.	2	+	.	.	.
Arctostaphylos uva-ursi (L.) Spreng.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.
***Gymnadenia nigra* (L.) Rchb.f.**	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.
Minuartia verna (L.) Hiern	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+
Dianthus integer Vis.	.	.	.	.	.	.	.	.	+	.	+	2	+	+	.
Sesleria juncifolia Suffren	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.
Achillea ageratifolia (Sm.) Benth. & Ho.f.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.
Phleum montanum K.Koch	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Geum montanum L.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.
Cerastium decalvans Schloss. & Vuk.	.	.	.	.	.	.	.	.	+	+	.	1	.	.	.
Arabis alpina L.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Saxifraga paniculata Mill.	.	.	.	.	.	.	.	.	+	+	.	+	.	.	.
Myosotis alpestris F.W.Schmidt	.	.	.	.	.	.	.	.	+	.	1	+	.	.	.
Fragaria vesca L.	.	.	.	.	.	.	.	.	+	+	.	.	+	.	.
Stachys alpina L.	.	.	.	.	.	.	.	.	+	.	1	+	.	.	.
Saxifraga scardica Griseb.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.
Carduus candicans Waldst. & Kit.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.
Erysimum comatum Pančić	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.
Achillea abrotanoides (Vis.) Vis.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+
Aubrieta columnae subsp. *croatica* (Schott, Nyman & Kotschy) Mattf.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Cerastium cerastoides (L.) Britton	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.
Vaccinium uliginosum L.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.
Rubus idaeus L.	.	.	.	.	.	.	.	.	+	+	+	.	+	+	.

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Anthyllis aurea Host	.	.	.	.	.	.	.	.	+	+	.	+	.	.	+
Campanula rotundifolia L.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+
Vaccinium myrtillus L.	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.
Luzula spicata (L.) DC.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Hypericum richeri subsp. *grisebachii* (Boiss.) Nym.	.	.	.	.	.	.	.	.	+	.	1	.	.	.	+
Jasione orbiculata Velen.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.
Saxifraga moschata Wulfen	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.
Salix retusa L.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+
Crepis aurea (L.) Cass.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.
Hieracium pilosum Froel.	.	.	.	.	.	.	.	.	+	+	.	+	.	.	.
Phleum alpinum L.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.
Onobrychis montana subsp. *scardica* (Griseb.) P.W.Ball	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.
Carex sempervirens Vill.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.
Trinia dalechampii (Ten.) Janch.	.	.	.	.	.	.	.	.	+	+	.	+	.	.	.
Aster alpinus L.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.
Linum capitatum Schult.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.
Silene saxifraga L.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Thymus praecox subsp. *zygiformis* (Heinr. Braun ex Wettst.) Jalas	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Trifolium noricum Wulfen	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+
Poa molinerii Balb.	.	.	.	.	.	.	.	.	.	+	+	+	+	+	+
Campanula spatulata Sm.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Luzula forsteri (Sm.) DC.	.	.	.	.	.	.	.	.	.	+	+	.			+
Oxytropis campestris (L.) DC.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Hieracium villosum Jacq.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Oenanthe peucedanifolia Pollich	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.
Dianthus sylvestris subsp. *bertisceus* Rech.f.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.

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Salix caprea L.	.	.	.	.	.	.	.	.	.	+	.	.	+	+	2
Primula elatior (L.) L.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Galium anisophyllon Vill.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	+
Achillea chrysocoma Friv.	.	.	.	.	.	.	.	.	.	+	1	.	+	+	.
Bromopsis cappadocica (Boiss. & Balansa) Holub	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.
Cyanus triumfettii (All.) Á.Löve & D.Löve	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.
Koeleria eriostachya Pančić	.	.	.	.	.	.	.	.	.	+	+	.	.	.	+
Dianthus scardicus Wettst.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Hieracium naegelianum Pančić	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.
Gentianella bulgarica (Velen.) Holub	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.
Bupleurum falcatum L.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Bupleurum karglii Vis.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.
Campanula glomerata L.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+
Saxifraga sempervivum K.Koch	.	.	.	.	.	.	.	.	.	+		+	.	.	.
Festuca koritnicensis Hayek & J.Vetter	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.
Armeria canescens (Host) Boiss.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.
Botrychium lunaria (L.) Sw.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Daphne cneorum L.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Dianthus microlepis Boiss.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.
Anthemis cretica L.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Scorzonera villosa Scop.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.
Pinus heldreichii H.Christ	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Pimpinella serbica (Vis.) Drude	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Trifolium velenovskyi Vandas	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
Tephroseris papposa subsp. *wagneri* (Degen) B.Nord.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.

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Barbarea balcana Pančić	.	.	.	.	.	.	.	.	.	.	.	.	2	1	
Eriophorum latifolium Hoppe	.	.	.	.	.	.	.	.	.	.	.	.	1	2	.
Dactylorhiza cordigera subsp. *bosniaca* (Beck) Soó	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
Luzula sylvatica (Huds.) Gaudin	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+
***Gymnadenia odoratissima* (L.) Rich.**	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+
Alchemilla viridiflora Rothm.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
Athyrium filix-femina (L.) Roth	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Epilobium palustre L.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	
Trifolium hybridum L.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
Filipendula ulmaria (L.) Maxim.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
Daphne mezerum L.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
Stellaria alsine Grimm	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
Doronicum austriacum Jacq.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+
Veratrum lobelianum Bernh.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	
Viola gracilis Sm.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
Thalictrum aquilegiifolium L.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
Ornithogalum gussonei Ten.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
Veronica serpyllifolia L.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
Geranium macrorhizum L.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
Clinopodium acinos (L.) Kuntze	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+
Cystopteris fragilis (L.) Bernh.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
Saxifraga adscendens L.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.
Epilobium montanum L.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
Rumex alpinus L.	.	.	.	.	.	.	.	.	.	.	.	.	+	2	
Veronica beccabunga L.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.

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Anacamptis coriophora (L.) R.M.Bateman & al.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Scorzoneroides autumnalis (L.) Moench	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Alchemilla velebitica (Janch.) Degen	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Epilobium angustifolium L.	.	.	.	.	.	.	.	.	.	.	.	.			4
Achillea atrata L.	.	.	.	.	.	.	.	.	.	.	.	.			1
Senecio squalidus subsp. *rupestris* (Waldst. & Kit.) Greuter	.	.	.	.	.	.	.	.	.	.	.	.			1
Fagus sylvatica L.	.	.	.	.	.	.	.	.	.	.	.	.			+
Trifolium alpestre L.	.	.	.	.	.	.	.	.	.	.	.	.			+
Achillea setacea Waldst. & Kit.	.	.	.	.	.	.	.	.	.	.	.	.			+
Pilosella officinarum Vaill.	.	.	.	.	.	.	.	.	.	.	.	.			+
Dianthus sylvestris Wulfen	.	.	.	.	.	.	.	.	.	.	.	.			+
Campanula foliosa Ten.	.	.	.	.	.	.	.	.	.	.	.	.			+
Sedum ochroleucum Chaix	.	.	.	.	.	.	.	.	.	.	.	.			+
Turritis glabra L.	.	.	.	.	.	.	.	.	.	.	.	.			+
Campanula persicifolia L.	.	.	.	.	.	.	.	.	.	.	.	.			+
Silene armeria L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Lathyrus pratensis L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Vicia sepium L.	.	.	.	.	.	.	.	.	.	.	.	.			+
Galium debile Desv.	.	.	.	.	.	.	.	.	.	.	.	.			+
Linaria angustissima (Loisel.) Borbás	.	.	.	.	.	.	.	.	.	.	.	.			+
Ligusticum mutellina (L.) Crantz	.	.	.	.	.	.	.	.	.	.	.	.			+
Valeriana montana L.	.	.	.	.	.	.	.	.	.	.	.	.			+
Stachys alopecuros (L.) Benth.	.	.	.	.	.	.	.	.	.	.	.	.			+
Galium mollugo L.	.	.	.	.	.	.	.	.	.	.	.	.			+
Populus tremula L.	.	.	.	.	.	.	.	.	.	.	.	.			+
Betula pubescens Ehrh.	.	.	.	.	.	.	.	.	.	.	.	.			+

Appendix 2

List of localities based on studied herbarium specimens of *Gymnadenia conopsea* [G.c.], *Gymnadenia frivaldii* [G.f.], *Gymnadenia nigra* [G.n.] and *Gymnadenia odoratissima* [G.o.] from Kosovo.

No.	Locality	Source data
Ferizaj District		
1	Bistër	G.o. = Berisha, N. (2019), G.c. = Berisha, N. (2011), G.f. = Berisha, N. (2014), G.n. = Rexhepi, F. (2004)
2	Brezovicë	G.f. = Rexhepi, F. (1980[P] / 1997 / 2001), Berisha, N. (2011), Millaku, F. (2012, 2014)
3	Jezerc	G.c. = Millaku, F. (2004)
4	Luboten	G.n. = Berisha, N. (2011, 2017), G.c. = Berisha, N. (2011), G.f. = Berisha, N. (2013, 2015, 2018), Rexhepi, F. (1983[P])
5	Nerodime (E)	G.c. = Millaku, F. (2004)
6	Përrojet e Durlës	G.f. = Rexhepi, F. (2013), Millaku, F. (2013), Berisha, N. (2014)
7	Piribreg	G.f. = Rexhepi, F. (1998[P], 2009)
8	Shtëpia e Malorëve	G.f. = Millaku, F. (2004), Berisha, N. (2014)
9	Tupan	G.c. = Berisha. N. (2011)
10	Vërtop	G.n. = Millaku, F. (2012)
Gjakova District		
11	Bishtazhin	G.c. = Rexhepi, F. (2007)
12	Bjeshka e Dobërdolit	G.c. = Millaku, F. (2006)
13	Bjeshka e Dobroshit	G.f. = Rexhepi, F. (2007)
14	Bjeshka e Junikut	G.f. = Millaku, F. (2013), G.c. = Millaku, F. (1991, 2007)
15	Bjeshka e Tropojës	G.f. = Millaku, F. (1988, 2013)
16	Gjeravicë	G.f. = Millaku, F. (2013), G.n. = Berisha, N. (2011)
17	Gryka e Lloqanit	G.f. = Berisha, N. (2014)
18	Junik	G.f. = Berisha, N. (2014)
19	Kurvallë	G.f. = Berisha, N. (2011)
20	Mirushë	G.c. = Millaku, F. (2009), Rexhepi, F. (1983[P])
21	Morinë	G.c. = Millaku, F. (2007)
22	Pllaçicë e Vokshit	G.f. = Millaku, F. (2012)
Prizren District		
23	Bresanë	G.c. = Millaku, F. (2003), Berisha, N. (2009)
24	Brod	G.n. = Millaku, F. (2000)
25	Carralevë	G.c. = Rexhepi, F. (2004)
26	Divjakë	G.c. = Millaku, F. (2004)
27	Dragash	G.c. = Berisha, N. (2011)
28	Jazhincë	G.c. = Millaku, F. (2004), G.f. = Rexhepi, F. (2010), G.n. = Millaku, F. (2012)
29	Koritnik	G.c. = Rexhepi, F. (2002, 2009), G.n. = Berisha, N. (2012)
30	Liqenet e Durlës, Sharr	G.c. = Berisha, N. (2011), G.f. = Millaku, F. (2012)
31	Liqeni i Shutmanit, Brod	G.f. = Millaku, F. (2001)
32	Lubinjë e Ulët	G.c. = Millaku, F. (2004)
33	Maja e Zezë	G.n. = Berisha, N. (2012), G.f. = Millaku, F. (2009)
34	Oshlak, Malet e Sharrit	G.n. = Millaku, F. (2011)
35	Pashtrik	G.c. = Rexhepi, F. (2007[P], 2010), G.n. = Rexhepi, F. (1999[P] , 2001), Millaku, F. (2009), Berisha, N. (2011)
36	Planej	G.c. = Rexhepi, F. (1979, 2006)
37	Prevallë	G.f. = Millaku, F. (2007); G.c. = Berisha, N. (2012), G.n. = Millaku, F. (1998, 2012)
38	Rapçë	G.c. = Rexhepi, F. (1988[P] ,1994, 2006)
39	Restelicë	G.f. = Millaku, F. (2011), G.c. = Millaku, F. (1999, 2003), G.n. = Berisha, N. (2011), Millaku, F. (2011)
40	Syrinika	G.c. = Millaku, F. (2005)
41	Vracë	G.f. = Millaku, F. (2010), G.n. = Berisha, N. (2011)
Peja District		
42	Bjeshka e Isniqit	G.n. = Berisha, N. (2017)
43	Bjeshka e Istogut	G.c. = Millaku, F. (1994, 2006)
44	Bjeshka e Lumbardhit	G.n. = Berisha, N. (2011, 2019)
45	Bjeshka e Sudenicës	G.c. = Millaku, F. (2000, 2006)
46	Bogë	G.c. = Millaku, F. (2004, 2008), G.n. = Berisha, N. (2012)
47	Hajlë	G.f. = Millaku, F. (2008); G.n. = Berisha, N. (2014)
48	Koprivnik	G.n. = Berisha, N. (2014)

No.	Locality	Source data
49	Kuqishtë	G.c. = Millaku, F. (2006, 2008, 2011); G.n. = Millaku, F. (2008),
50	Leqinat	G.c. = Millaku, F. (2006), Berisha, N. (2018), G.f. = Millaku, F. (1997), Berisha, N. (2015), G.n. = Berisha, N. (2015, 2018)
51	Lumbardh	G.c. = Millaku, F. (1989, 2001)
52	Maja e Rusolisë	G.f. = Berisha, N. (2010, 2015), G.n. = Millaku, F. (2012)
53	Mali Mokna	G.f. = Millaku, F. (2013), Berisha, N. (2015), G.c. = Berisha, N. (2012)
54	Marijash	G.n. = Millaku, F. (2009)
55	Peklen	G.n. = Berisha, N. (2019)
56	Qafë e Bogiçës	G.f. = Berisha, N. (2012, 2015)
57	Radavc	G.c. = Millaku, F. (2001)
58	Rekë e Allagës	G.c. = Rexhepi, F. (1997 [P]), Millaku, F. (2009)
59	Roshkodol	G.c. = Millaku, F. (2005)
60	Shtupeç	G.c. = Millaku, F. (2005)
61	Shushicë	G.c. = Millaku, F. (2001)
62	Zajm	G.c. = Millaku, F. (2010)
63	Zhleb	G.n. = Millaku, F. (2001)
Mitrovica District		
64	Bellobërdë	G.c. = Rexhepi, F. (2005)
65	Bërzancë	G.c. = Rexhepi, F. (1999 [P], 2004)
66	Çirez	G.c. = Millaku, F. (2007)
67	Çubrel	G.c. = Rexhepi, F. (2005)
68	Druar	G.c. = Rexhepi, F. (1981)
69	Kaçandoll	G.c. = Rexhepi, F. (1988 [P] , 2000); G.n. = Millaku, F. (2009)
70	Kopaonik	G.n. = Rexhepi, F. (1979 [P])
71	Oshtro Koplje	G.n. = Berisha, N. (2018)
72	Rakinicë	G.c. = Rexhepi, F. (1987 [P] , 2005)
73	Rashan	G.c. = Rexhepi, F. (1989)
74	Runik	G.c. = Rexhepi, F. (2000 [P], 2005)
75	Turiçec	G.c. = Rexhepi, F. (2005)
76	Vesekovc	G.c. = Millaku, F. (2009), Rexhepi, F. (1997 [P]), G.n. = Berisha, N. (2012)
Prishtina District		
77	Batllavë	G.c. = Rexhepi, F. (2001)
78	Blinajë	G.c. = Millaku, F. (2014)
79	Bradash	G.c. = Rexhepi, F. (2001)
80	Gërmi	G.c. = Rexhepi, F. (2000 [P], 2009), Berisha, N. (2017)
81	Golesh	G.c. = Berisha, N. (2016)
82	Koliç	G.c. = Millaku, F. (2000)
Gjilan District		
83	Busovatë	G.c. = Rexhepi, F. (1999)
84	Gmicë	G.c. = Millaku, F. (2004)
85	Novobërdë	G.c. = Rexhepi, F. (1977, 1982 [P], 2001)
86	Prallovë	G.c. = Rexhepi, F. (2004)
87	Qarrak	G.c. = Rexhepi, F. (2001)
88	Smirë	G.c. = Rexhepi, F. (2001)

Note: Private vouchers offered by prof. F. Rexhepi are indicated with a letter [P].